MAKING A "PERSONAL" SET FOR THE BLIND

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MAKING A "PERSONAL" SET FOR THE BLIND

This A.C.-D.C. metal-tube set was designed to suit the special needs of a blind person—a personal set. It has many features.

C. W. PALMER

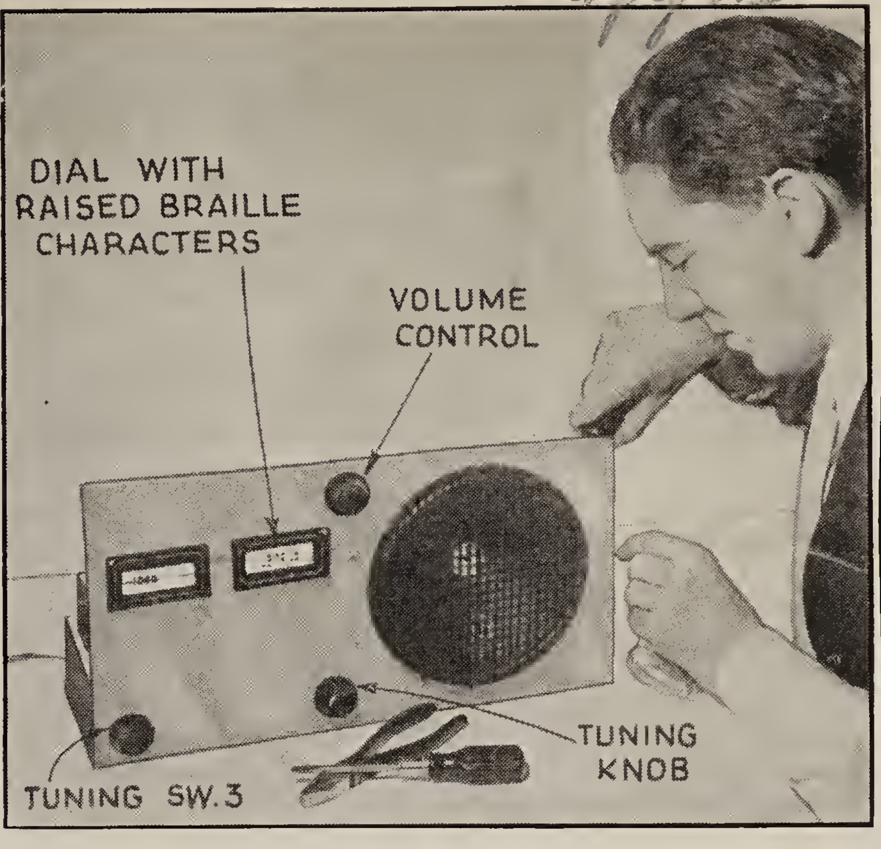


Fig. A. This set has both braille and roman numerals — switch tuning of local stations, iron-core coils—phone attachments—tone control, etc.

SPECIALIZED radio sets have been gaining favor in recent years, as evidenced by the development of all-wave sets for the home; portable sets for the traveling man; auto sets for the motorist; communication receivers for commercial radio communication, etc.

However, this specialization is only in its early stages of development and we will no doubt find many types of receivers to fill many different needs as they originate.

RADIO HANDICAPS OF THE BLIND

One such need is in homes where a blind person resides. In such homes an unusual condition naturally exists. The blind person has difficulty in tuning to a particular station because of a lack of some reference point which will permit tuning to a desired spot on the dial. Also, the blind person depends on radio for most of the entertainment he or she enjoys, which means that the radio set is operated for many hours of every day, and this might cause annoyance to other members of the household.

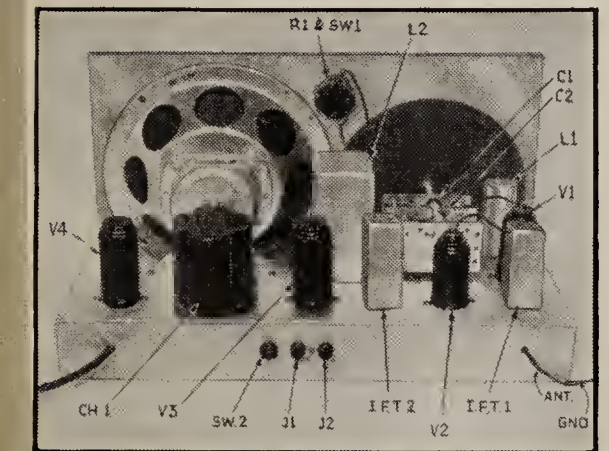


Fig. B. The back of the set showing the positions of the parts "above board."

Also, there is a second possibility that the listener may have affected hearing as well as sight. In this case, the volume of the radio set would be excessive for the other occupants of the house or apartment.

The receiver described here has been designed to overcome all these possible annoyances, so that the blind person can fully enjoy the news, recreation and educational possibilities afforded by modern broadcasting facilities. First, the tuning problem is solved by using a special dial having *raised "braille" numbers* on one scale—thus telling the setting to which the receiver is adjusted. And to further facilitate tuning the local stations, a switch of the rotary type is arranged with pre-set condensers so that 5 of the local stations can be tuned-in simply by rotating this switch! Other stations are located by means of the raised braille numbers. (These characters, embossed on special pasteboard, were made available through the kind cooperation of the American Foundation for the Blind.)

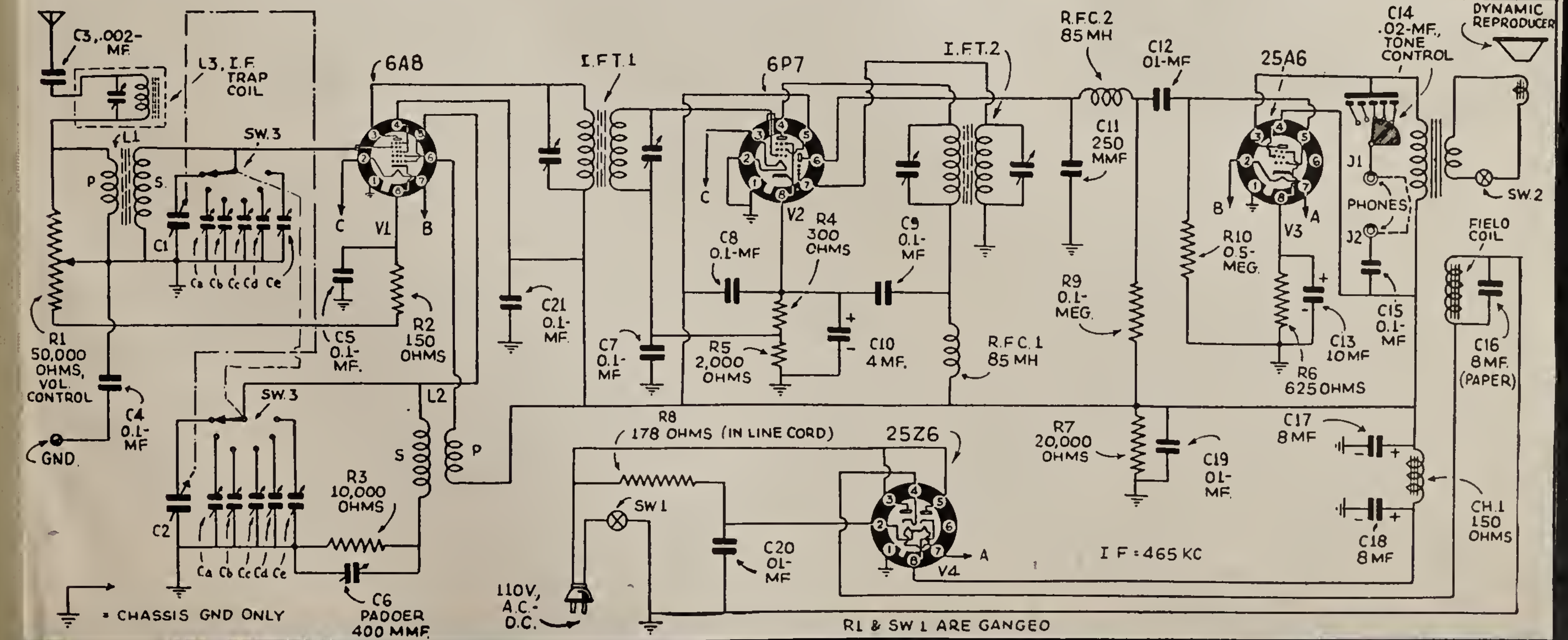
And for listeners who are blessed with sight, a second scale on the tuning dial supplies the usual roman numerals of frequencies in kc.

The second problem is solved by the addition of 2 phone-tip jacks for a pair of headphones to be plugged in, and a switch to cut out the loudspeaker if desired, so that either the phones and speaker, or the phones alone can be used.

THE CIRCUIT

The receiver incorporating the above features is a (*Continued on page* 616)

Fig. 1. The circuit and values of the superhet. The volume control resistance may be 25,000 ohms as specified in the list of parts.



NEWEST APPLICATIONS OF ELECTRONICS

Some of the very latest photoelectric developments as they are used in industry are here described. Learn the principles of operation of the Spectrophotometer; the production of "Audible Light," and the functioning of the Water Locator.

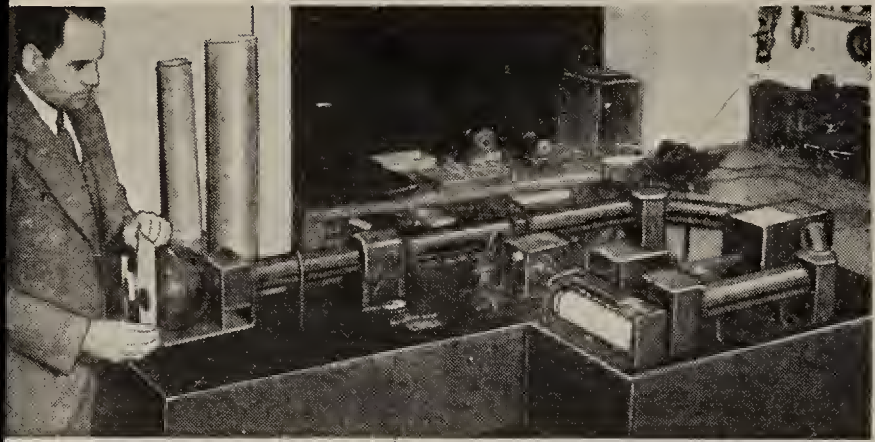


Fig. A. A PE. cell is used in the Spectrophotometer. (G. E. photo)

HOWARD G. McENTEE

PHOTOELECTRIC devices have been finding more and more applications in industrial and laboratory procedures. In fact, the electronic "eye" has become one of the most important adjuncts to the many inspecting and counting operations involved in quantity manufacturing, whether the product is paper, cigars, tin can wrappers or beans!

A few examples of such laboratory and industrial photoelectric methods, as well as a few applications of other electronic devices of unusual interest are described here to give readers an idea of the trend of development in these closely allied fields.

THE "SPECTROPHOTOMETER"

In Fig. A is an instrument called a photoelectric *spectrophotometer*. It is used to quickly and accurately analyze the color make-up of a wide variety of materials. A sample of the object or material to be so checked is placed in the machine and in less than 3 minutes a chart is made showing the wavelength of each color of light reflected by the sample as well as the "quantity" of each color in the color make-up!

The exact *composition* of any color in dyes, inks, paints, etc., is often confusing. For example there are blue-blacks, brown-blacks and red-blacks; while actually there is very little black coloring matter made which is "pure" black. Similarly, there are wide variations in whites—and in other colors. Such color analyses are made easy with the spectrophotometer.

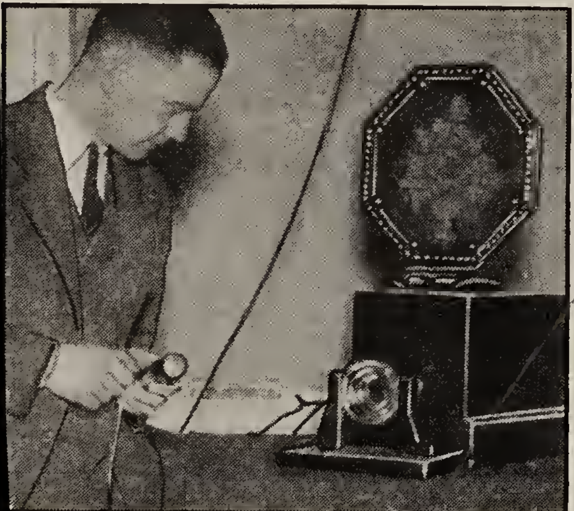
The photoelectric spectrophotometer shown in Fig. A, consists of (a) a *monochromator* which is an instrument used in physics labs for accurately breaking light into its component color parts; (b) a photoelectric *photometer* which measures or indicates the quantity of each color of light; and (c) a *drum recorder* which makes graphs of the findings of the photometer. By a skillful method, the individual discrepancies of the instruments are balanced out, thus producing very accurate results. A circuit of this instrument is shown in Fig. 1.

AUDIBLE LIGHT

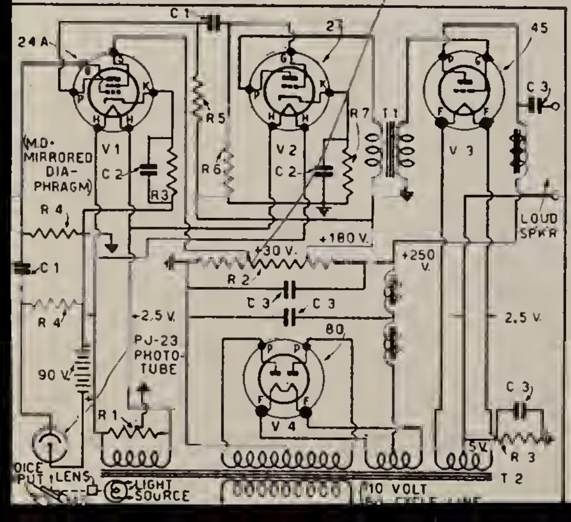
If you were to address yourself to a beam of light and then keep your eyes on a distant spot where that beam was focused, would you be surprised to hear your voice repeating what you said?

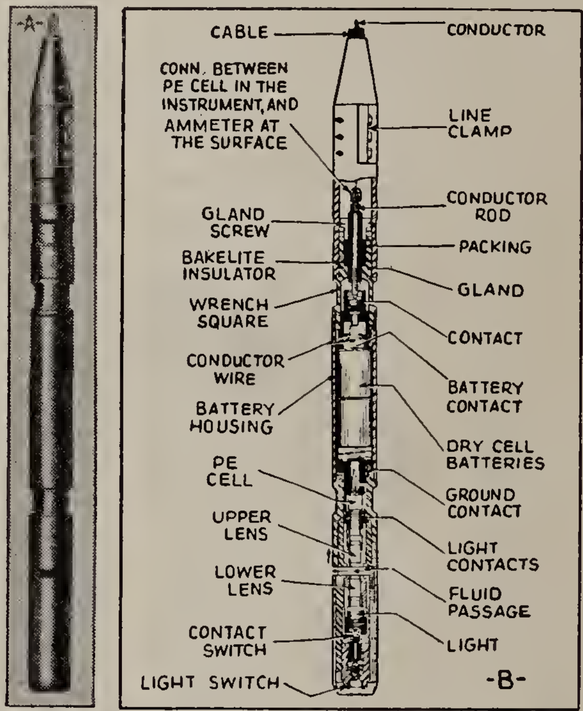
This is another accomplishment of the PE. cell. Any experimenter can demonstrate to himself how this is accomplished, by connecting a PE. cell to an A.F. amplifier and holding an electric light bulb in front of the cell. If the light is operated from the 60-cycle power supply line, a loud hum will be heard from the reproducer. This is the 60-cycle hum produced by the variations in intensity (modulations) of the light from the bulb.

And if the experimenter wishes to go further, a diaphragm having a highly-polished back can be set up as shown in Fig. 2 so that light from a bulb (operated from D.C.) is reflected into the PE. cell. Now if you talk against the diaphragm, (*Continued on page* 615)



ig. B, above, production of the so-called "audible ght." Fig. 2, below, the circuit used. (G. E. photo)





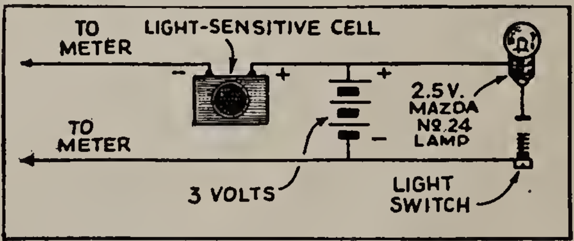
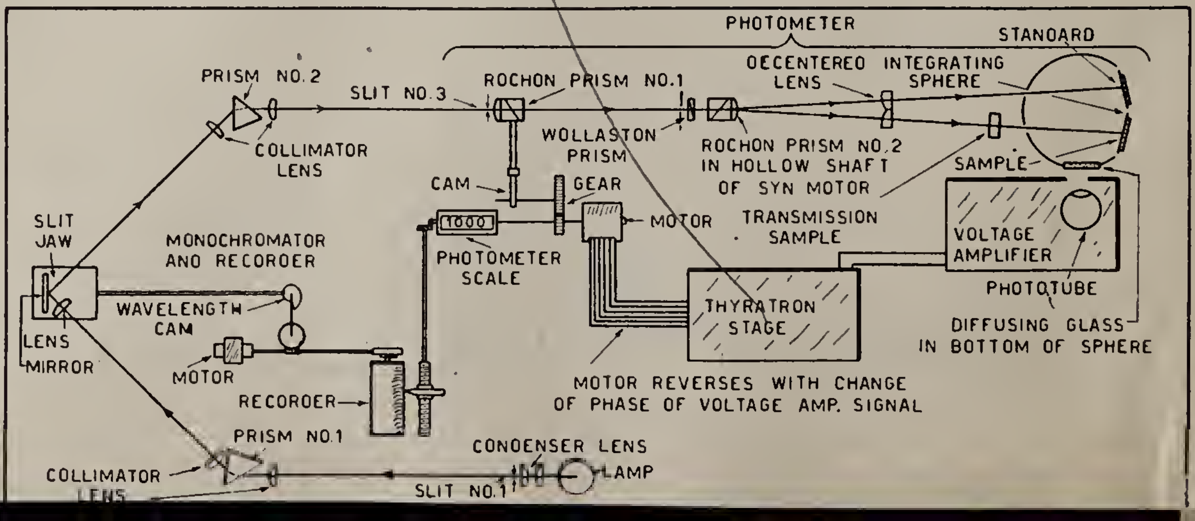


Fig. 3, right above, cutaway view and outside view of the water locator. Fig. 4, right, the circuit. Fig. 1, below, spectrophotometer circuit. (Dale photo)



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MAKING A "PERSONAL" SET FOR THE BLIND

(*Continued from page 585*)

superhet. of the latest type, having an A.C.-D.C. power supply unit. Iron-core coils are used throughout to produce the greatest possible efficiency in a small space. Metal tubes are also employed, for the same reason.

A 6A8 is used as combined first-detector and oscillator. This is followed by a new type metal tube—a 6P7. This tube is a combined *pentode* and *triode* which acts as both the I.F. amplifier and the second-detector. By an unusual method of tapping the bias resistor, the single cathode is allowed to supply the correct bias for pentode I.F. amplifier and triode detector. The A.F. tube is a pentode—a 25A6—which is similar to the type 43 having a 25-V. filament.

The rectifier tube is a double cathode tube similar to the 25Z5 glass tube. One cathode is used for plate supply to the tubes while the other supplies the field current for the speaker.

The filter choke in the power supply unit is a special type unit having windings designed to reduce the degree of hum to the lowest possible level. The coil is enclosed in a heavy shield to limit the field surrounding the coil. These precautions were taken because the set is to be used with phones and even a low hum level becomes annoying after a time when you are wearing headphones.

Condenser C20 prevents annoying clicks, etc. (due to electric light switches being snapped off and on, etc.), on headphone reception; reverse the line plug for least hum.

An adjustable *tone control*, C14, consisting of a group of small fixed condensers and a switch, all in one bakelite case mounted on the side of the cabinet, takes the place of the usual resistor and condenser. This serves the double purpose of blocking condenser for the phones and tone control. This hookup of the phones permits the use of Rochelle salt "crystal" headphones.

THE CONSTRUCTION

The layout of the parts can be seen from the photos. It is not essential to follow the layout exactly, though any wide change might cause circuit oscillation or hum and it is advisable, therefore, to follow the layout as nearly as possible.

The circuit is straightforward and should cause the amateur set builder or Service Man little trouble.

When the wiring is finished and the set is ready for adjustment, turn the tuning switch to the position for normal tuning and adjust the trimmers on R.F. and I.F. coils as well as the padder of the oscillator over the entire broadcast band.

Finally, adjust the double pre-set (Ca to Ce) condensers for the various local stations desired, moving the station-selector switch, Sw.3, to the correct position for each station as desired.

(Additional details concerning "pre-set" condensers are contained in the article, "Making the Lazyman '4' Receiver," October, 1935, *Radio-Craft.)*

LIST OF PARTS

*One set of polyiron coils, antenna (1501) oscillator (2000) and trap coil (R4561), L1, L2 and L3;
*Two polyiron 465 kc. I.F. transformers, (types C101m and C200m) IFT1 and IFT2;
One Wholesale Radio 2-gang, 365 mmf. variable condenser, C1 and C2;
One Solar (TQD) dual 70 mmf. trimmer Ca;
One Solar (TQD) dual 100 mmf. trimmer Cb;
One Solar (TQD) dual 140 mmf. trimmer Cc;
One Solar (TQD) dual 220 mmf. trimmer Cd;
One Solar (TQD) dual 400 mmf. trimmer Ce;
*One dial (with special braille numerals for blind section, and kc. scale for visual tuning);
One IRC 150 ohm, 1 W. resistor, R2;
One IRC 10,000 ohm, ½-W. resistor, R3;
One IRC 300 ohm, 1 W. resistor, R4;
One IRC 2,000 ohm, 1 W. resistor, R5;
One IRC 625 ohm, 1 W. resistor, R6;
One IRC 20,000 ohm, 1 W. resistor, R7;
One Blan 178 ohm line cord resistor, R8;
One IRC 0.1-meg. 1 W. resistor, R9;
One IRC 0.5-meg. 1 W. resistor, R10;
One Centralab 25,000 ohm volume control, with line switch, (No. 4 taper) R1 and Sw.1;
One Centralab 2 circuit, 6 position switch, Sw.3;
One Aerovox or Cornell-Dubilier .002-mf. condenser, C3;
Seven Aerovox or Cornell-Dubilier 0.1-mf. condensers, C4, C5, C7, C8, C9, C15 and C21;
One Solar 400 mmf. padder, C6;
One 4 mf. Aerovox or Cornell-Dubilier 50 V. electrolytic condenser, C10;
One Aerovox or Cornell-Dubilier 250 mmf. condenser, C11;
Three Aerovox or Cornell-Dubilier .01-mf. condensers, C12, C19, C20;
One Aerovox or Cornell-Dubilier 10 mf. 50 V. electrolytic condensers, C13;
*One tone control, C14;
One Aerovox or Cornell-Dubilier 8 mf., 200 V. paper condenser, C16;
Two Aerovox or Cornell-Dubilier 8 mf., 200 V. electrolytic condensers, C17, C18;
One Wright-DeCoster 8 in. dynamic speaker with 2,000 ohm field, and transformer for type 25A6 tube;
One Alloy Transformer Co. 150 ohm filter choke in a heavy alloy case, Ch.1;
Four Eby octal sockets;
Two Hammarlund 85 mhy. R.F. chokes, R.F.C.1 and R.F.C.2;
One Blan aluminum chassis, 16 x 6½ x 2 ins. high;
One Blan shorting-type phone tip-jack unit, J1, J2;
One Blan snap-switch, Sw.2;
*One coronet 6A8 tube, V1;
*One coronet 6P7 tube, V2;
*One coronet 25A6 tube, V3;
*One coronet 25Z6 tube, V4;
One cabinet, and miscellaneous wire, screws, etc.
(*Names of manufacturers sent upon receipt of a stamped, addressed envelope.)

OPERATING NOTES

(*Continued from page 596*)

bypass. The leads to the screen-grid were clipped, the screen-grid tied together and bypassed with a .5-mf. tubular condenser and no further trouble was experienced. This condenser has been found defective in several of these sets.

Kennedy 4 A.C.-D.C. The receiver cut out and was very noisy. A thorough check of the chassis revealed all components to be OK. Finally, each tube was jiggled in its socket, whereupon the trouble was localized in the socket of the 6B7 tube. A loose connection was found at the plate terminal of the socket. This was resoldered and the receiver gave no further trouble. STANLEY STOLBA

A.C. Dayton "Navigator"—Unusual Tube Fault. One of the most baffling cases we have ever had was an A.C. Dayton, Navigator. This set had excellent selectivity but hardly any volume. The voltages and current measurements were normal and no defective parts could be found in the circuit. The owner had mentioned something about "special tubes," and this led us to investigate as to what kind of tubes the set had originally used. Sure enough, the set had come equipped with Speed tubes, which have a very high mu. The repair was effected by replacing all of the 27-type tubes in the set with 56-type tubes, after which the set had plenty of volume. EUGENE KINGREY

Echophone (No model number visible). The complaint was, terrific noise, while tuning and at times weak reception, more noticeable on deep tones. (Note: the line switch is on the tone control.)

An analyzer test disclosed nothing at first but when reception "blocked" and the tone control shaft became hot it showed a defective tone control condenser, with resultant lack of plate voltage.

Bending plates out of tuning condenser cleared up the tuning noise. They had been touching in certain positions.

Lyric Model D. The owner complained of rising and falling volume. Also, turning on a light in the house would cause volume to be deafening. Oscillation was sometimes apparent.

An analyzer test disclosed correct voltages, tubes tested OK, also substituting new ones gave no different reception.

The remedy was a new volume control. Also added .25-mf. to screen-grid and cathode bypass units which cures oscillation in all these models.

Philco Model 20. The set made a noise like an express train. An analyzer test gave no indication of incorrect voltages. All units and tubes tested OK but a new volume control made reception normal. DAVIS RADIO SERVICE,
Portage La Prairie, Man., Canada

NEWEST APPLICATIONS OF ELECTRONICS

(Continued from page 586)

the light will be modulated with your voice instead of the 60-cycle variations of the power line. By this means, you have accomplished the seeming impossibility mentioned above—you have made your voice modulate a light beam.

For those interested in the amplifier shown in Fig. 2, the following values apply:

T1—A.F. Transformer;
T2—Power transformer, 600 V., center-tapped high-voltage winding, 5 V. filament winding, and two 2.5 V. filament windings;
R1—60-ohm resistor, center-tapped;
R2—13,100-ohm resistor:
R3—1,500-ohm, 1-W. resistors;
R4—10-meg. resistors;
R5—0.1-meg. resistors;
R6—1-meg. resistor;
R7—2,500-ohm, 1-W. resistor;
C1—.01-mf. condensers;
C2—2 mf. condensers;
C3—7 mf. condensers;
Ch.1—output choke;
Ch.2 and Ch.3—30 hy. filter chokes;
"B"—90 V. battery.

OIL-WELL WATER INDICATORS

The electronic engineer has even invaded the oil fields, for in Figs. 3 and 4 we have equipment which will locate with great accuracy, the depth at which water is entering an oil well. In the past, efforts have been made to make such measurements, but the general method has been to add to the contents of the well, such materials as will make the liquid electrically conductive, then to measure the amount of such conductivity at various levels.

The newest scheme operates on the principle of the difference of light conductivity of liquid, as measured by a photoelectric cell. The results are said to be more uniformly accurate, and the test may be made much more quickly.

The method is very simple. The well is first "conditioned," by dumping in a quantity of mud or dye which will uniformly color the water and lower its light conductivity. The mixture is circulated so as to form a uniform density. A test run is then made with the instrument and a graph drawn from the readings of the associated meter. Then a quantity of the water in the drilling is bailed out to allow the so-called "formation water" to enter. The water locator is then again dropped down the shaft and the meter readings plotted on the graph. Next, a third run is usually made after more water has been bailed out. The last run is made after mixing the fluid near the source of the formation water with the bailer. The 4 curves are then studied and the source of the water can be very accurately determined.

The actual locator is quite simple in construction, as may be seen by reference to Fig. 3B. At the extreme bottom is a screw switch, by means of which the light is turned on before the apparatus is dropped down the shaft. The water enters a passage at the bottom of the casing and passes up over the lower lens and out the side of the casing. In doing so it intercepts the light beam to the PE. cell, which is located directly above. This interception causes changes in the current through the PE. cell which are transmitted through the cable to the meter on the surface.

The simple circuit used is shown at Fig. 4.

AN AUTOMATIC ELECTRONIC POTENTIOMETER

(Continued from page 598)

he final readings. Changes in supply voltage, acuum-tube characteristics, photo-cell efficiency, light-source intensity, etc., lie outside he critical circuit. Thus, the instrument can e used on the regular power supply, and need ot be checked against a standard cell. The tandard resistor is arranged for plug-in connection, so that the range of the instrument may e changed at will.

This article has been prepared from data upplied by courtesy of Weston Electrical Intrument Corp.

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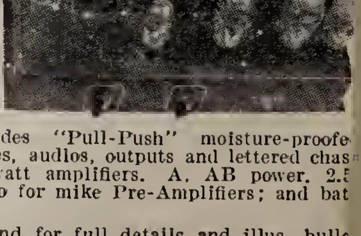

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